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Dr. Whittlesey is a professor of geography, Harvard University and a frequent contributor to geographic literature. In recent years he has been particularly interested in political geography. Among his recent contributions are: Political Geography, *Education*, Vol. 55 (1935); Andorra's Autonomy, *Journal of Modern History*, Vol. 6 (1934); Trans-Pyreanean Spain: The Vall d'Aran, *Scottish Geographic Magazine*, Vol. 49 (1933). Other articles on political geography will appear in future issues of the JOURNAL, one by Margaret Means and another by Robert M. Brown.

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Dr. Dicken is an assistant professor of geography, University of Minnesota. For the past six years he has been studying geographic conditions in some of the limestone regions of North America, especially western Kentucky, central Florida, and northeastern Mexico. Other reports on these studies will appear in *Economic Geography*, and the *Journal of Geology*.

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Mr. Hoover is head of the department of geography, State Teachers College, Tempe, Arizona. He has devoted many years to a study of the American Indian and his desert environment. His article, Geographic and Ethnic Grouping of Arizona Indians, appeared in the JOURNAL, September, 1931. Other contributions have appeared, or will soon appear, in the *Geographical Review*, *Bulletin Geographical Society of Philadelphia*, *Scientific Monthly*, and *American Anthropologist*.

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VOLUME XXXIV APRIL, 1935 NUMBER 4

AUSTRIA: A GEOGRAPHIC HUB OF EUROPEAN POLITICS

DERWENT WHITTLESEY
Harvard University

Austria, for the past thousand years a significant political entity, and for some centuries a leading European power, has in recent years emerged as a political danger spot, in spite or because of being reduced to the rank of petty state by the misfortunes of the World War. Such persistence in political significance thru the shocking vicissitudes of millennial European history suggests a geographic character of more than ordinary distinction. This Austria possesses in the small but productive lowland which is the seat of Vienna and the core of the country (Fig. 1).

Between the mighty Alps and the lesser bastion of low mountains which protects Bohemia, the Danube, major routeway since prehistoric times, furrows its way from its upper course in the hills of Bavarian Germany to its less turbulent but still powerful meandering across the Hungarian Plain. On leaving the hills it traverses an anteroom of lowland before breaking thru the gate where the Little Carpathians and the Leitha Range stand like sentinels. Northward from this anteroom the Morava Valley opens routes to the Elbe and the Oder—links to the North Sea and the Baltic; southward alternative passes thru the high but much broken Alps lead to the Adriatic gulf of the Mediterranean. From the Baltic shores amber is known to have moved southward since before the days of written record, and many other goods surely must have followed all these passways in the irrepressible trade between Mediterranean and Northern Europe. At the focus of trade formed by the crossing of these east-west and north-south routes, the Romans found it worth while to establish a military and commercial city on the site of a Celtic settlement. Europe has never since been without its Vienna.

Touching one of the outer strands of the Danube, which traces a braided pattern across the flat and fertile, but frequently flooded

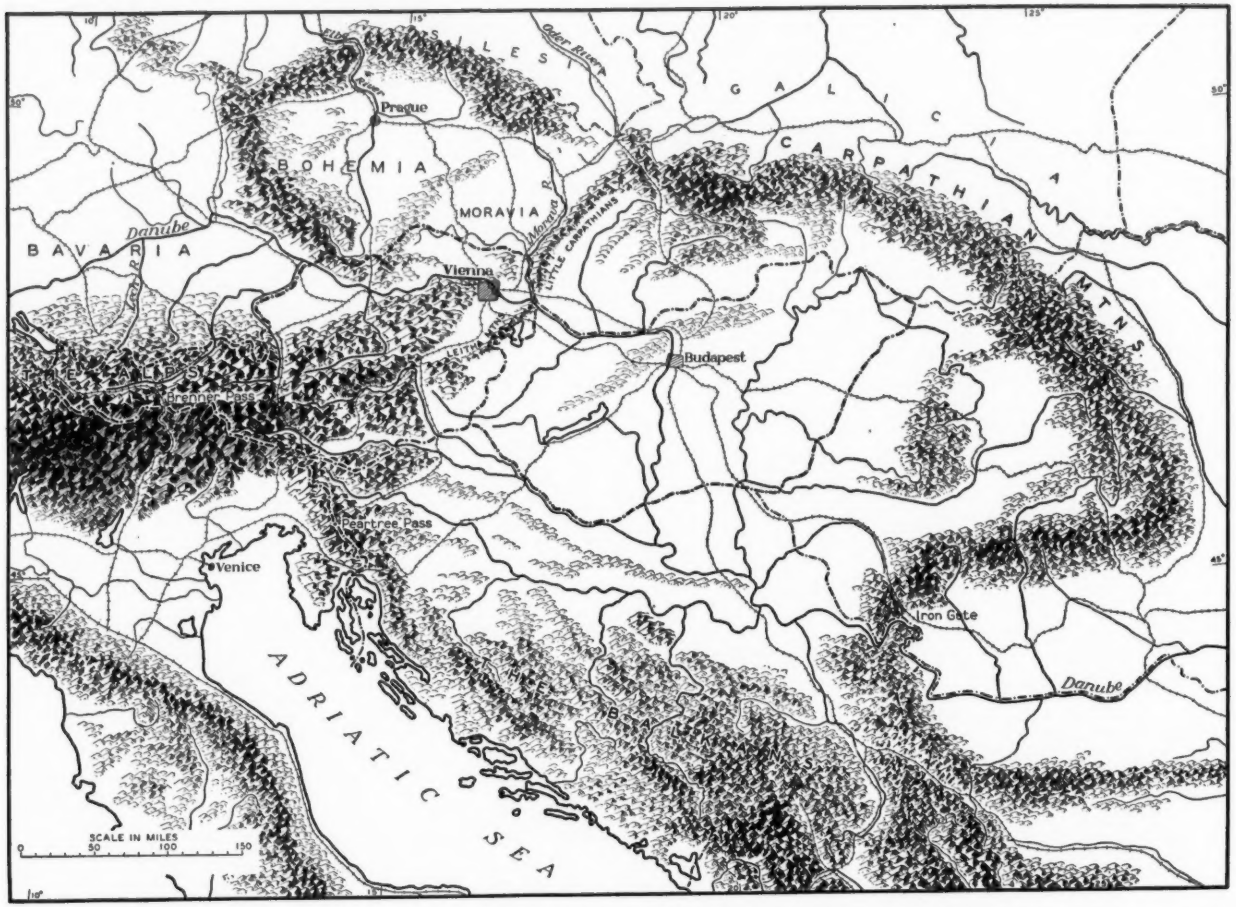

FIG. 1. Austria in its post-War setting of critical natural and political features.

Vienna Basin, the city has been able to profit from water-borne trade without being innundated by the stream itself or by floods of barbaric horsemen who periodically have broken thru Austria's lower gate and made their way toward central and western Europe. Defended by the hills which lie at its back, Vienna, by stalwart resistance to these hordes, has repeatedly earned the thanks of Western European civilization, of which Austria was so long an outpost.

As everybody knows, Vienna was left by the treaties at the close of the World War a city of 2,000,000 people in a country of only 6,000,000. This ratio of capital to country is extreme, but not phenomenal; Buenos Aires has 2,000,000 to Argentina's 10,000,000. But Vienna grew up on a much broader foundation than post-War Austria. Its political establishment had been geared to a world power and its trade and manufacturing supplied the wants of one of Europe's largest states. Suddenly it was reduced to be the capital of a little group of mountain valleys, and new-made tariffs and other laws of jealous neighbors paralyzed business. But Vienna has not suffered alone. By virtue of its location a corner-stone of the European edifice, a disrupted Austria has weakened the whole structure.

The Austria of today is the German-peopled segment of the pre-War empire in which German Austria was dominant. There is historical fulfillment in this. The country has had continuous independent existence since it was planted in the tenth century by the powerful German state Bavaria to protect its open Danubian door against the tribesmen who were being forced out of semi-arid central Asia by prolonged drouth, and who in 955 had reached the Lech River in progressively victorious inroads (Fig. 1). Moreover, the Hapsburg dynasty, under which Austria expanded far beyond its German area, originated in mountainous Styria and at one time controlled all the passes of the central as well as the eastern Alps. But in this case historical fulfillment imperils European peace, since an Austria reduced to its German territory is strongly drawn toward political union with Germany. To Germany, present-day Austria is merely an unredeemed fringe along its southern border, a district wholly indefensible in the military sense. The major states of western Europe fear a Germany increased by six million people and a world metropolis. Italy objects in addition to the replacement of weak Austria along its northern border by strong Germany. This objection is grounded in the conformation of the Alps, thru which run passes rising gently from the Austrian side but precipitous as

FIG. 1. Austria in its post-War setting of critical natural and political features.

approached from Italy (Fig. 1). The consequent military disadvantage Italy has well learned, from the incursions of Germanic tribes during the Dark Ages, the repeated German armies flung into Italy during the centuries of struggle between German Emperors and Italian Popes, and the tenacious hold which a strong Austria fastened upon Venice and its hinterland—a hold not entirely broken until the close of the World War.

The full portent of Austria in European politics appears, however, only in connection with the Basin of the Middle Danube.

For several centuries after its establishment Austria, as a military outpost of Bavaria, found full scope for its powers in fending off interloping swarms of nomads. As late as 1683 Turks stormed the walls of Vienna. But in the intervals of peace operations of merchants were binding all the neighboring country to the natural hub, Vienna, and step by step the flag followed trade. Passes thru the Alps as far west as the Brenner (Fig. 1) lead to the Viennese lowland, and these Austria retained when the passes of the Central Alps fell into other hands. The Bohemian bastion is weak on the south, and from Vienna trade, backed by military force, enmeshed the partly Germanized Czechs in the Austrian state (Figs. 1 and 2). To obtain control of the Peartree Pass and an outlet to the Adriatic Sea, Yugoslav and Italian territory was annexed. Beyond Bohemia and the Carpathians a slice of Poland was incorporated with no such clear geographic excuse as may be found for the other annexations.

Meanwhile Austria had come to terms with its nearest down-Danube neighbor. The Hungarian Plain, which Austria was founded to hold in check, remained invincible so long that when its people finally emerged as a Europeanized state, they could not be conquered. Instead, Austria and Hungary formed a working union. This was prompted by the complementary nature of their resources, Austria being a trading and manufacturing unit with dairy products the chief rural output, and Hungary a producer of feed- and food-grain and livestock for slaughter. Thanks to its military tradition, founded on nomadism and nurtured by guerilla warfare against the long dominant Turk, Hungary's boundaries expanded until they coincided with the well-marked ring of Carpathian and Balkan mountains (Fig. 1). Even the Danube entered and left the country thru defiles in the encircling heights. Like the Austrian state, Hungary effected political unity too late to mold the peripheral people into linguistic and cultural uniformity, but included blocs of Slovaks (close relatives of the Czechs), Croats, Rumanians, and

scattered settlements of Germans. The pre-War Hungarian Kingdom corresponded to a geomorphic entity, altho it was no more a linguistic and cultural unit than its partner Austria.

Measured by economic geography Austria-Hungary as a dual monarchy was powerful and well balanced. The Hungarian Plain served as larder (grain and meat); the Carpathian and Balkan hill country provided forest products, including hogs, and here and there metals; these productive Hungarian lands lay in the clasp of Austria

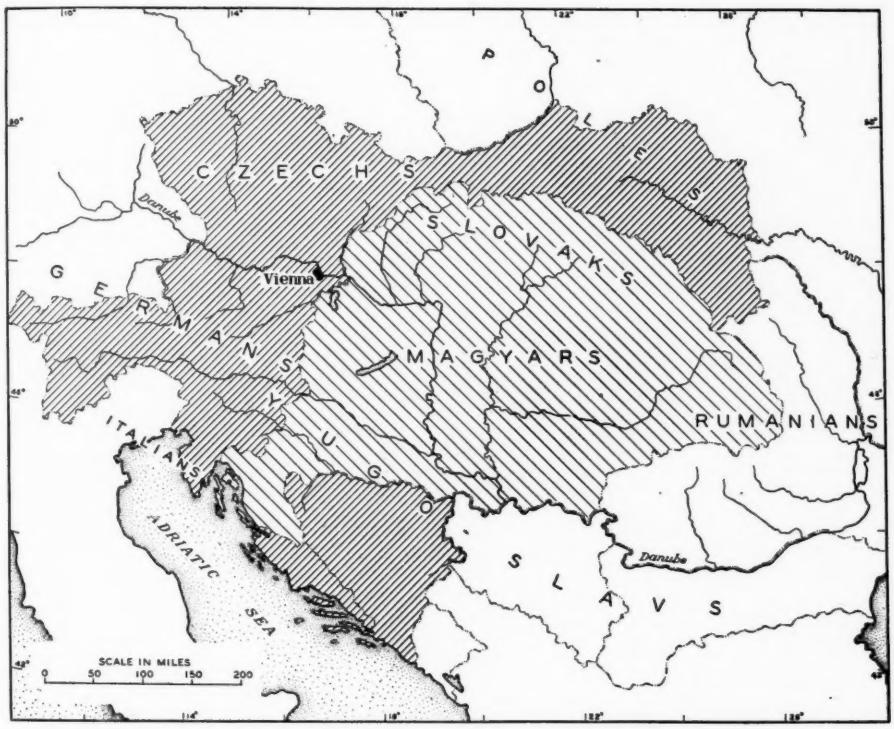

FIG. 2. Pre-War Austria and Hungary, set in a matrix of diverse peoples. Austrian territory is shaded dark, Hungarian territory light. Political boundaries of neighboring states are outlined.

(Fig. 2). To the north of them the coal, iron, and petroleum of Bohemia, Moravia, Silesia, and Galicia furnished the sinews of manufacture; to the south, even after Venice had been ceded to Italy, Austria retained access to the sea. The two claws of this curious geo-political animal had for a body German Austria. Mainly a mountainous, dairying country, its plexus is the trade ganglion, Vienna, thru which all parts of the empire were integrated and by

means of which each profited from political connection with the others.

In creating a state of the Central Danube region Vienna realized its destiny in the realm of *economic* geography. The lowland basin is sharply set off from the plain of North Europe by the steep, forested Carpathians, and definitely, altho much less effectively by the wooded hills which link the Carpathians to the Upper Danube —a trade divide stretching from the boundary between Austria and older Germany to the Iron Gate (Fig. 1). Only in Polish Galicia did Austria transgress the naturally marked border of an exclusive Middle Danube state. Nature has less pointedly demarked the southerly border of the basin. Control by Austria of all the Alpine passes which lead toward the Adriatic Sea necessitates a long and arbitrary northern boundary toward Germany. The urge toward salt water which every state feels and few have failed to satisfy, can be argued as a reasonable explanation for this inclusion of the eastern Alps in a Middle Danube state. Eastward from the Adriatic, the Middle Danube state must find its limit somewhere in the Balkans. If the Austro-Hungarian monarchy did not there coincide with the ideal boundary, it must be admitted that the ideal is difficult to determine, even judged by landforms alone.

But however well balanced its economic geography no national state can be assured of long-lived success without a satisfactory correlation of its political geography. There must be a combination of customs, tradition, language, and history sufficiently uniform to create that intangible emotional unity—nationality. And a common nationality the Austro-Hungarian Empire lacked. The state was triply weak: its technical organization was dual, a scheme which fostered friction and provided a standing invitation to disruption; each of the two parts held in unwilling embrace three or four inimical peoples, every one of which ardently longed for independence or political affiliation with cognate peoples outside the state; Austria itself, head and heart of the monarchy, remained German and subject to the powerful attraction of political Germany, expressed thru the culture and history which Austrians share with the whole German folk.

All the time that Austria had been forging a world power out of discrete nationalities, it had exerted a vigorous, often a dominant sway in the German realm. While older Germany was breaking up under the weight of the feudal system and the Imperial dignity, the ruler of Bavaria's eastern outpost was developing a consolidated

military state, in practice free from interference from the mother country from which he derived his technical authority. In 1156 Austria was acknowledged independent of Bavaria and before the end of the thirteenth century the Duke of Austria and the Emperor of all Germany were one. The imperial title carried more dignity than power, but it insured Austrian participation in every important German event of the succeeding 700 years. It was only in 1866 that Austria, long a Middle Danube power, was forced to step out of German politics.

From this moment Austria was devoted exclusively to the Austro-Hungarian Empire, sound enough as an economico-geographic unit, but dissident as a politico-geographic entity. Only the passage of long time and probably also the substitution of free federation of the several nationalities for the dual monarchy could hope to achieve political stability in the Middle Danube Basin. Instead, the World War intervened, weakening the economic structure of the area and widening its political fissures into chasms. By the peace treaties the region was rearranged in rough accordance with nationality—excepting only Austria itself, which, deprived of its business of heading a powerful Middle Danube state, has for fifteen years been denied its alternative destiny, union with Germany. Little wonder that post-War Austria has been bowed down by economic depression and upheaved by political strife!

Controlling most of the passes of the Eastern Alps into Italy, and incorporating the ancient and ineluctable route focus, Vienna, the country is perhaps too valuable to be allotted to any one of the existing powers. Without territorial access to the sea, defenceless along most of its northern and eastern borders, it must remain a country coveted or feared by its neighbors: Germany, nearest of kin and physically proximate; the Middle Danube states, for which Vienna remains the geographic plexus; Yugo-Slavia and Italy, fearful lest the urge to gain a sea frontage bring new armies across those Alpine passes, so often traversed by hostile forces. If Austria remains independent but not aggrandized, the reason will be found in the mutual jealousy of other European states. It will not be the first nation thus grudgingly but nevertheless effectively guaranteed an independent existence.

GALEANA: A MEXICAN HIGHLAND COMMUNITY*

SAMUEL N. DICKEN
University of Minnesota

Galeana, a community of 1600 inhabitants, is located in southern Nuevo Leon at an elevation of 5300 feet. Settled about the year 1678 by people of Spanish descent, it had no indigenous basis of Indian culture differing in this respect from the older villages of the Central Plateau. Galeana lies in a rather isolated region, herein called the northern "Sierra Madre Oriental," which extends from Monterrey to the vicinity of Tula (Fig. 1). The outstanding relief features of the region may be described as a series of roughly parallel ridges and valleys, trending north 20° west, with the strike of the highly folded and faulted limestones; thus the ridges appear as hogbacks or cuestas, rising in some cases 3,000 to 4,000 feet above the valleys. The boundaries of the region on the east are quite clearly shown as the abrupt change from the dissected cuestas to the marine-cut piedmont near Linares and C. Victoria. To the west, north and south the boundary is indefinite, representing a transition from the Sierra to the basin-range country. Partly because of its mountainous quality the region is isolated from the main lines of transportation. Penetrated by no railroad or highway, access is from the east thru the narrow canyons or over cuestas and basins from

FIG. 1. Sketch map showing the location of Galeana in southern Nuevo Leon. The dotted line is the approximate limit of the region described as the northern "Sierra Madre Oriental."

* This study was aided by a grant from the Rockefeller Foundation thru the University of Minnesota.

Saltillo or Matehuala. In spite of the beginnings of highway construction, most transportation is by oxcart and burro, tho automobiles are sometimes used. Thruout the region the limestone outcrops are a conspicuous feature in the landscape, as are the "terra rossa" and chocolate brown soils derived from them. Underground drainage is common and springs are widely distributed, furnishing directly or indirectly most of the water supply.

The isolated settlements are in the most fertile valleys where water is available. Villages, haciendas and ranchos share about equally in the distribution of the desirable land. The type of land utilization is changing: the villages are adding apple trees to their fields of corn, and on many of the haciendas, hard, red, winter wheat is grown on the maize fields, or is encroaching on the grazing land. The aridity of the larger basins, as well as the steep slopes of the humid eastern portion, limits sharply the expansion of agriculture.

Galeana lies in a strike valley bordered on the east by the Sierra de Laboradores, a limestone hogback with steeply dipping strata, its leeward western slope covered with mesquite, cactus and agave, fit only for the goat herd which daily climbs its slope. To the west are a series of cuestas which culminate in Mt. Potosi, 15 miles away and nearly 10,000 feet above sea level. The pueblo occupies a confluence site; the arroyo from the north is dry but the tributary from the west, fed by a natural lake is perennial, occupying a narrow channel 25 to 100 feet deep.

Marginal Landscapes

To the east of Galeana the dissected alluvial fans offer little opportunity for cultivation (Fig. 2); their surfaces, except as recently dissected, are so strongly indurated to a depth of 3 or 4 feet as to be almost as resistant as the bed rock from which they are derived. The lower portions of the fans contain a few water tanks for the goats, and where the spurs extend onto the flood plain, there are home sites for the peons who cultivate the east side of the valley floor. In the arroyos between the large fans, small secondary fans are cultivated, the chief crops being beans, maize and maguey. Low rock walls running with the contours on these small fields serve to check erosion and to utilize surface drainage for irrigation. On the west side of the valley there is an alluvial terrace which slopes down and away from the main valley, its longitudinal gradient greater than that of the flood plain so that the irrigation ditch below the scarp is able to reach the southern flank. The scarp of the terrace

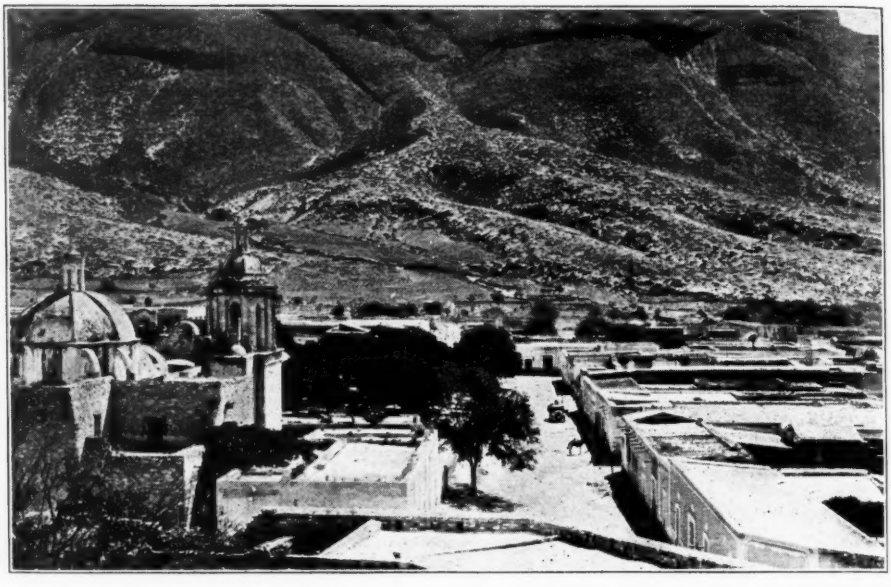

FIG. 2. Looking eastward across Galeana toward a large alluvial fan, its dissected and indurated surface showing some evidence of solution. A small area of recent alluvium below the fan is in beans and maguey, irrigated by the scanty surface water from the leeward slope of the sierra. In the pueblo single story and adobe houses front directly on the street.

is steep and shows well marked meander scars; at the upper end there is a large spring supplying additional water for irrigation (Fig. 3). Too high for irrigation under present conditions, the "mesa" provides a scanty pasture for the burros, which in spite of the advent of the automobile, are still the principal means of transport. Altho quarries in the edge of the terrace reveal steeply dipping strata, the chief surface constituent is a weathered limy alluvium, sufficiently hard to be used in lieu of adobe in walls, fences and houses.

An important factor in the life of the village is the lake, two miles west of the village and 250 feet higher. At the foot of Mt. Potosi is a broad basin with imperfect surface drainage: the lake lies in an elongated solution depression partially filled with alluvium to which only short intermittent arroyos are tributary. Near the lake there are many solution basins and many of the tributaries are sinking streams. The lower end of the lake basin is filled with alluvium also, and it was necessary to dig an artificial outlet in order to use the water for irrigation. Considering that the lake is at least 100 feet deep, that it receives little or no surface drainage,

and at the same time is supplying water for irrigation with very slight fluctuation in level, there is evidently an underground inlet.[1] On the shore of the lake is the small village of Laguna, the inhabitants cultivating the limited irrigable land in the low basin near the lake. Laguna is in reality a part of Galeana, having no stores or market of its own, the peons traveling by foot, oxcart or burro to Galeana to make their modest purchases.

THE CULTIVATED VALLEY FLOOR

The irrigated area on the flood plain is crescentic in form (Fig. 3) : the upper part in the tributary valley, the lower and larger part

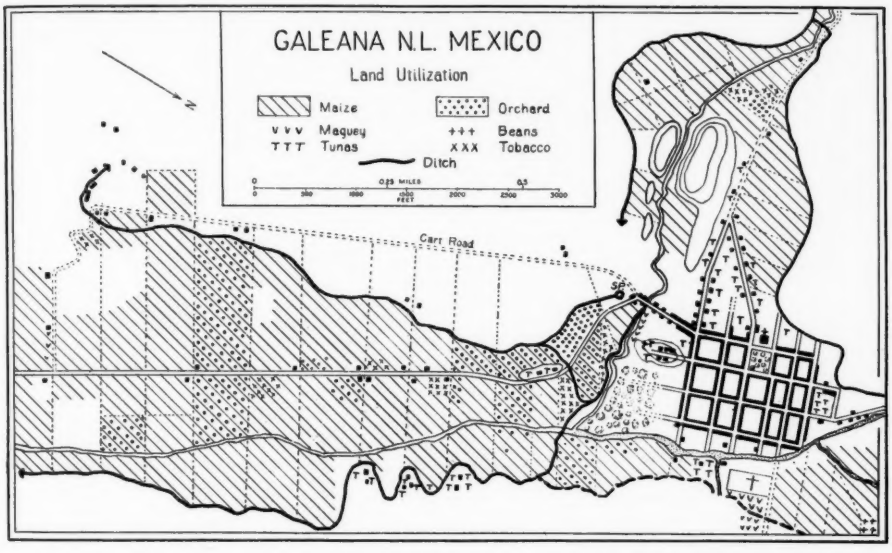

FIG. 3. Sketch map of Galeana and its cultivated fields made in the summer of 1933.

in the main valley south of the village. In the summer season nearly all the land is in corn; in the winter a part, probably a third, is planted in wheat. The flood plain is divided into two strips by the arroyo, but since the original property lines extended entirely across the valley, cultivation varies little, except that most of the apples are grown on the west side. This has come about because the landowners have retained more active management of the land near the road, i.e. the west side. Most of the fields are tended by share-croppers, who return one-third to one-half of the crop to the

[1] The solution forms and also the older fans and terraces are probably associated with a more humid Pleistocene climate. See Jaeger, Fritz, Forschungen über das diluvial Klima in Mexico. *Peterm. Mitteil.*, Erg. Heft 190. 1926.

owner. The corn is planted by hand in hills, the time of planting varying from May to July. Tho the best yields of corn are very low, the crop is nevertheless the mainstay in the diet of the peons.

The map (Fig. 3) shows the wide distribution of maize on the cultivated land of the village, with deciduous fruits, mainly apples, superposed on the maize cultivation. Maize is still planted in the rows between the fruit trees, in many orchards. Apparently in the early days of settlement, maize was practically the only field crop,

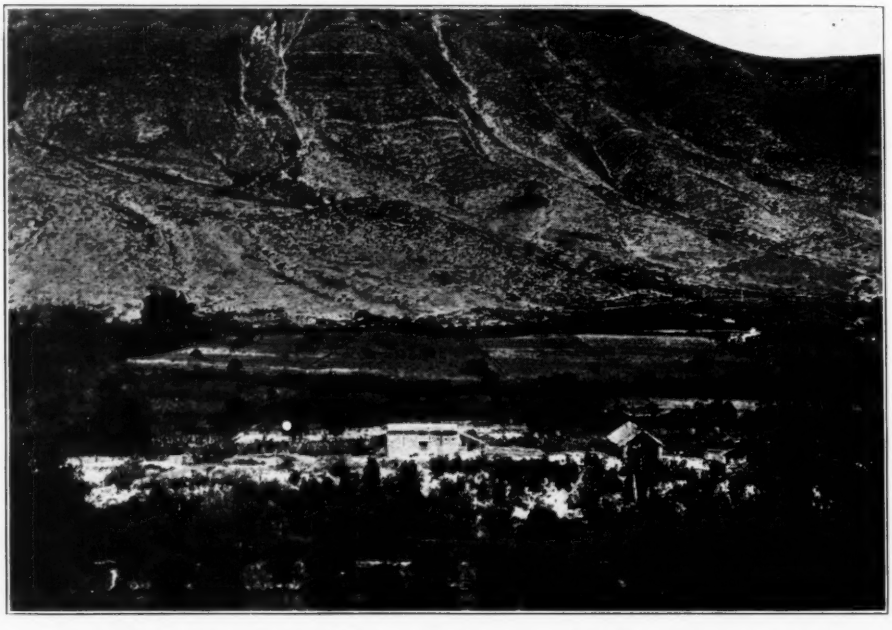

FIG. 4. Most of the apple orchards of Galeana are planted in corn, or to put it more accurately the fruit trees have been planted in the corn fields. In this view there are also figs and walnuts.

supplemented by small garden patches of tunas, maguey and an occasional fig tree near the houses. The most important changes have been the introduction of wheat as a winter crop, which has been only partially successful, and the addition of apples. Both wheat and apples are money crops, the peons consuming very little of either. Intensive cultivation is confined to the valley floor which can be easily irrigated, the main ditches following the edge of the flood plain. The water is diverted from the perennial stream which is in turn fed by the lake; additional water is supplied by the spring as previously noted. There is no charge for water, each landowner contributing some labor toward keeping the ditches in repair. The

use of the water is spasmodic rather than regular; in late summer and winter the ditches are frequently dry because the temporary diversion canals have crumbled.

On the west side of the valley is one of the best orchards (Fig. 4) with apples, English walnuts, and figs. In spite of the lack of spraying or pruning, the fruit is of fair quality and a good share of the crop is shipped to the lowland especially to Linares, a town forty miles to the east and down 4,000 feet. It is exchanged for manufactured articles, sub-tropical fruits and, in lean years, additional maize.

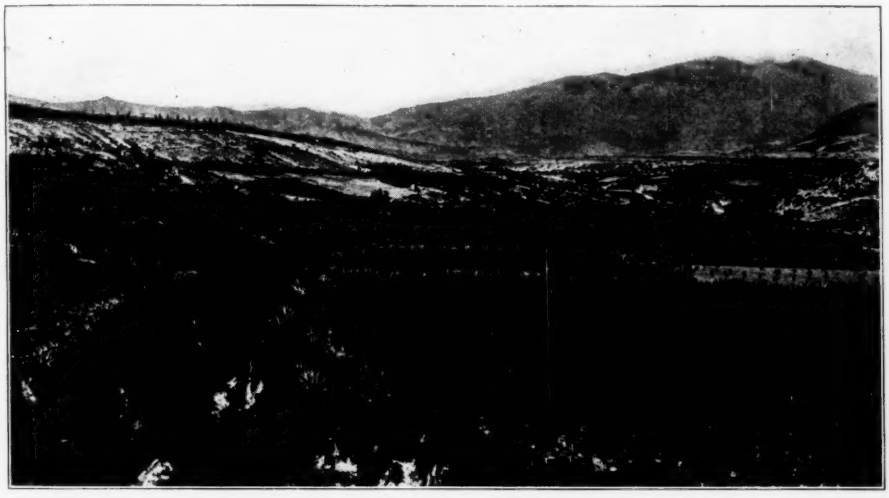

FIG. 5. Above the village the corn fields with maguey hedges cover the valley floor, excepting a young apple orchard (right) and a small field of tobacco (center). The arroyo is about fifty feet deep and carries the water for the fields below the pueblo.

Above the village in the tributary valley the fields of corn and their maguey hedges cover the valley floor (Fig. 5). The maguey supplies in addition maguey de pulque, a light alcoholic beverage which is consumed in spite of local prohibition. There is a young apple orchard and there are also two small fields of tobacco, but no houses, the peons living in the village. One factor tending to concentrate the houses in the village proper is the source of soft water, the sole supply being at the plaza. The irrigation water contains too much lime and sulphur to be suitable for drinking or washing.

At the west edge of the village (Fig. 6), the fields are smaller, the peons live on their plots, their houses fronting the road leading

to the lake. Yuccas and tunas are to be observed in addition to corn and maguey; the yuccas, called "palmas" by the peons, are used for thatching the roofs of the poorer houses, and for making cordage, which in commerce is called ixtle. The tunas or cactus "apples" form a very important item in the diet of the people

FIG. 6. At the west edge of the pueblo there are the usual corn fields, maguey hedges, and stone fences. There are also a few yuccas and near the houses tuna orchards.

during the season, July and August. Tunas are also sent to the low country where they are greatly prized.

THE PUEBLO

The original site of the pueblo or village proper was a small hill south of the village (Fig. 3). Shortly after the permanent foundation, the menace of the nomadic Indians in the vicinity diminished and the village occupied its present site. The nucleus is the church and the plaza, but since steep hills to the west restricted expansion, the church and the plaza have become somewhat eccentric. The direction of the rectangular street pattern was controlled by the original property lines which were laid off transverse to the valley floor and roughly parallel to each other. Aside from the church and the Normal School, there is very little difference in the external appearance of the buildings, whether commercial or residential. The houses and shops crowd the streets, and with their patios occupy all the land in the block (Fig. 2). The construction is usually of adobe with beams of timber to support the earth (or tile)

roofs. Most of the shops face the tree-covered plaza, which is the focus of commercial and social life. The most interesting feature of the plaza is the tap from which the entire supply of soft water for the village is derived. The source is a spring on the slope of the Sierra de Laboradores. Functionally the part of the village near the plaza is occupied by shops and the residences of the landowners, the fringes of peons, but there is little external evidence of this fact.

CONCLUSION

The site and culture of Galeana are in many ways representative of the larger region described in the first paragraphs. Northward and southward from Galeana, a series of connected basins form three long depressions with intervening ridges. Only the coincidence of fertile valley and good water supply affords adequate basis for settlement and since the rains come from the east, the most favorable sites are on the eastern sides of high ridges. Nearly all the water is supplied by springs, but even where water is comparatively abundant, corn suffers for lack of heat, especially in the valleys which lie above 7500 feet.[2] Wheat gives comparatively better yields and the acreage is increasing slowly, which together with the increasing importance of deciduous fruits, probably represents the most important cultural change in the region since settlement.

[2] At Galeana (el. 5300 feet) the July mean is 70° F., the annual rainfall 19 inches.

SOUTHWESTERN DESERT VEGETATION, ITS ADAPTATIONS AND UTILIZATION

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A casual survey of the rainfall and vegetation maps of the world brings out the fact that about one-fourth of the land surface of the earth and nearly one-fourth of the area of continental United States is arid or semi-arid. Hence the significance of these lands should not be slighted. Altho sparsely populated there have risen from them dynamic cultural forces which have spread to the ends of the earth. Also they hold much significance for the future. We have been passing thru an era of cultural development and expansion based upon humid lands, but in looking for new worlds to conquer, the surge is against the barriers and restrictions imposed by aridity. As Isaiah Bowman puts it, "These are the regions where environment conspicuously affects the lives of men."

In the United States a line drawn across the southern end of Nevada and continuing southeastward along the borders of the northern and central highlands of Arizona, sets apart from other arid areas of the United States a province distinctive for its peculiar and picturesque vegetation. It is known to plant ecologists as the Sonoran Province and varies in altitude from sea level at the mouth of the Colorado River to about 4000 feet. The rainfall varies from less than 3 inches to about 15 inches. The vegetation increases in abundance eastward toward the highlands, due, not only to increased total rainfall, but to a larger summer percentage. At Barstow, California, in the Mojave desert only 5 per cent of the rain falls in the three warmest months, at Needles, 34 per cent; and at Tucson, 50 per cent.

To many the mention of a desert conjures up pictures of barren desolation in which the characteristic element is drifting sands, whereas bare areas, especially of drifting sands, are only occasional features. In a favorable season a desert may be lovely in its sweep of green and brilliant bloom, but it can be just as cruel with its burning summer heat with absence of water or shade.

Adaptation to aridity, as to other unfavorable life conditions compels low or slow metabolism, hence the desert plants are characteristically slow of growth and tenacious of sluggish life. Xero-

phytism expresses itself in highly specialized devices or modifications on the one hand for the securing of water, and on the other, for conserving it. In the case of the desert annuals, seed production is speeded up and the life cycle is shortened to bring it within the scope of the few weeks of moisture following rains.

The many varieties of cacti are especially interesting and unique among the plants of the Sonoran Desert, and illustrate several modes of xerophytic adaptation. The cacti, like camels among animals, are remarkable for their ability to absorb and store water. The bisnaga or barrel cactus, by way of illustration, will yield enough water to quench human thirst and to save life if its interior be pounded to a pulpy mass. Most of its roots are short, spongy, and shallow so as to absorb much water quickly during the heavy downpours which come at long intervals. It is therefore very easily uprooted, but will continue alive for months or years on its stored up water supply. Evaporation surface is reduced to a minimum thru a single cylindrical stem with leaves reduced to thorns. The surface is fluted, or ribbed, enabling it to expand or shrink according to moisture content. The disposition of leaves necessitates the relegation of their functions to the stem surfaces, which are therefore green.

The leaves of the desert plants, if at all present, are small and are either cast off in the dry periods, or their edges are turned to the sun. Leaves of shrubs are further protected from evaporation by waxy, scaly or hairy surfaces.

The root system of the creosote bush is typical of the desert shrubs. Even when it would seem that not a particle of moisture could be left in the soil, the plant is able to find enough moisture to keep going the spark of life. The roots ramify widely near the surface and penetrate deeply, but the plants must be widely spaced to share the limited moisture. The ability of the roots of the creosote bush to gather moisture where there is a minimum of it, and to penetrate the *caliche* or hard limey precipitate general beneath the surface of arid soils, enables it to thrive on the long sweeping areas of gentle slope of the arid basins, often to the exclusion of any other perennials. So, altho one of the most useless of plants, its presence relieves, what otherwise would be complete desolation of extensive areas. At no great distance from the observer the bare spaces between the plants seem to disappear, and unless the season is unusually dry, the receding plain appears as a vast expanse of green.

On the lower flat bottoms of the basins, more moisture accumulates, but escapes almost or entirely by evaporation. Hence the soil becomes charged with salt and alkali. Here the salt bushes have undisputed domain, except perhaps for a scattering of greasewood. Most common of the salt bushes are Suoeda and several varieties of Atriplex, which superficially resemble sage brush. If a permanent or temporary stream has entrenched a flat below the general level of the plain, this will be covered with the thorny mesquite, trees or bushes. The presence of mesquite is an indication of ground water. The plant requires plenty of moisture but is able to send its roots 30 to 40 feet to secure it. Along the channels of the main streams such as the Colorado, Gila, and Salt Rivers grow occasional groves of cottonwoods; and where soil or sand is subject to shifting, the long reed like arrow-weed or the recently introduced tamarisk takes hold.

Most varied and most luxuriant is the vegetation of the long rocky and gravelly slopes of the Arizona desert mountains or highlands residuals. Here there is more moisture and less alkalinity, because there is more rainfall over the highlands, and the drainage follows the sub-areal rock extending from the mountains. Here the cacti grow in greatest abundance. Lines of the thorny palo verde, and ironwood, mark the courses of the washes and between them the gray Franseria, also suggestive of the sages, is the characteristic shrub. In the higher elevations of the mountain margins, the yuccas and agaves become conspicuous.

Utilization of Desert Plants

American settlement in the Southwest is very recent and is exotic to the desert. Beyond some grazing of indigenous forage plants, and cutting of the stunted trees for fuel, little use has been made of the desert plants. The many Indian cultures, prehistoric and recent, however, developed in the desert, entirely dependent upon their desert environment.

The present day Indian tribes of the desert, including Papagos, Pimas, Maricopas, Yumas, and Mojaves, number about 13,000. Formerly they sustained themselves entirely from the desert, and largely by the use of wild plants. But today, the Indian tho still using a variety of foods made from desert plants is becoming, like the white man, dependent upon the can opener.

The uses of desert plants may be classed as food for man and for domestic animals; materials for fibers, shelter, fuel, medicine,

soap, and other manufactured products; and protection from erosion. Frank Russell in his ethnological report on the Pimas,[1] lists among the native plants used by them for food, 22 of which the stems, leaves or flowers were eaten, 4 which furnished roots or bulbs, 24 seeds or nuts, and 15 which supplied fruits or berries. He also lists 18 plants used for medicine, tho it is not certain that all these remedies were effective.

Outstanding among the desert plants for their importance in the economy of the native peoples, have been the mesquite, the shuaro or giant cactus, along with other varieties of cacti, and the yuccas and agaves.

FOOD PLANTS

The beans of the mesquite were a very important item in the diet of all the southern Indian tribes, including the Apaches. The Pimas, Mojaves and Yumas who lived on, or adjacent to the river flats, where the mesquite beans grew so abundantly, were especially dependent upon them. They are fattening and hence these river Indians have always shown a marked tendency to obesity and indolence. Especially the Mojaves depended upon these beans to such an extent that they developed only a trifling part of their productive agricultural resources. Olive Oatman, who was captive among them for several years in the early 1850's, stated that they produced insufficient wheat to maintain one-fifth of their population.[2] The mesquite beans were gathered for miles around and were thoroly dried to be used when their vegetables and grain were exhausted. They failed to provide for lean years, and when occasionally the mesquite crop failed there was distress and even famine. The screw bean is another variety of mesquite whose spiral pods were gathered and prepared in a variety of ways. Mesquite beans are still much consumed by all the southern tribes, and even the Apaches made regular trips into the southern mountain valleys to gather them. The supply is now much curtailed by the livestock which feed avidly upon them.

The palo verdes or Parksonias also produce beans which may be eaten as gathered, or after being pounded in a mortar. The ironwood makes similar contributions.

Next in importance among the desert plant foods comes the fruit of the sahuaro and other cacti. The sahuaro fruit may be eaten

[1] Frank Russell. The Pima Indians. Twenty-sixth Annual Report of American Ethnology, 1904-1905.

[2] R. B. Stratton. Captivity of the Oatman Girls.

raw, dried, cooked into preserves or jam, or the juice may be made into a drink. The seeds are used to make seed cakes, or are ground into meal. The Papagos to whom the fruit of the sahuaro is especially important, have made the time of its harvest the occasion for feasting. The blooming of the sahuaro marks the beginning of the Pima New Year. Each June finds many Papago and Pima families going out to gather the fruit, perhaps working a half day and obtaining about 50 pounds of the huge berries from which the wine ("tis-win"), is made for the fiesta or other future occasions.

The fruit of the prickly pears was eaten in moderation and prepared for future use also. The famous Burbank spineless cactus is a cultivated variety of the prickly pear. Prickly pears are also cultivated by the Mexicans, and is then called by them, "Napal." With plenty of moisture, the joints or segmented stems grow much larger, have fewer thorns, and assume a bluish green color. The fruit also grows much larger, has a better flavor and remains a pale yellowish green.

Even certain species of the Cylindropuntias, as Opuntia arborescens, a long stemmed thorny branching cactus, were collected in large quantities. The usual method of preparing the fruit for future use was to dig a pit and heat stones in it. After the fire died down the stones were removed and a layer of the Suoeda salt bush was placed over the coals. Above this was placed a layer of the cactus fruit, then the hot stones and so on alternately to the top. After a night, the fruit was taken out, dried, and stirred to remove the thorns, and stored away. The smaller cacti of the genus Cereus also bear edible fruit, but are less abundant. One large plant of the hedge hog or strawberry variety will yield about one to two quarts of fruit which the Papagos eat raw or cook into jam or conserves. The bisnaga or barrel cactus also yields an edible fruit, but the plant is becoming increasingly scarce due to its slow growth and its popularity for use in the commercial cactus candy. The Indians ate it after cutting it into strips and boiling it all day. Sometimes it was boiled with mesquite beans, a layer of each, in the cooking olla.

The favorite vegetable of the Apaches and a delicacy with all the desert tribes was "mescal," obtained from the agaves, commonly known as century plants. The entire plants were cut when signs of the flowering stalk appeared. These were trimmed down and prepared in large pits somewhat after the fashion of the Opuntia-arborescens described above. After cooking for several days

with a fire on top, the mescal became a sweet pasty mass which was dried in the sun.[3] The fruit of the Spanish bayonet was dried, ground on the metate, or boiled with flour by the Pimas, and cooked in ashes and dried for future use by the Apaches.

A number of small plants were cooked as greens. Salt bushes were often boiled with other foods to give them a salty flavor. The stems were also boiled with wheat and used as stuffing for roast rabbit. The heads were pounded and screened to separate the seeds, which were washed, dried, parched in an olla, then ground on a metate and eaten as "pinole."

If we include the higher and rainier mountain slopes of the highlands marginal to the desert, then to the list of important food plants may be added pinon nuts gathered by the Apache Indians for the American market, and acorns which are stewed by them, parched and ground into meal.

FORAGE PLANTS

The wide spacing of the desert perennials, their thorns, or their leathery, scaly or hairy surfaces, together with their paucity of leaves or bad taste, as in the case of the creosote bush, render them generally unsuitable for browse or pasture. But since the annuals of the desert are so ephemeral, it is upon the perennials the grazing must depend most of the time. Yet this is the only important use to which the white man has put the desert vegetation. The nutritious gramma grass, abundant in the northern highlands, formerly grew with some luxuriance in the higher moister parts of the desert province. It is still found growing in the protection of thorny bushes and would if given opportunity come again to its own. After rains, the floor of the desert becomes carpeted with alfilaria, a low tiny geranium, which is fattening to cattle. In long periods of drought the food on the desert becomes so scarce that most of the cattle must be removed or large numbers perish. Some of the desert shrubs including the salt bushes are fairly good natural forage. If better feed is scarce, the cattle will eat the prickly pear or munch the spiny jointed chollas, the most vicious of opuntias. The chollas supply water as well as nutriment. Stockmen sometimes chop up the stems of the yucca and feed them to the cattle.

YUCCA FIBER AND SOAP

The yuccas and agaves have played the most varied rôle in the economic progress of the native southwestern cultures.

[3] Bourke. On the Border with Crook.

Especially important were the long strong leaf fibers which were woven into textiles since prehistoric times. Thus they were used for textiles, skirts, head bands, martial cloaks, laces, belts, sandals, and leggings. For many centuries the fibers of the long wiry leaves of the yucca have been used by the Indians in the making of heavy cords, ropes for ladders, burden carriers, saddle bags, and lariats. The leaves themselves were used in making sleeping mats and crude saddle blankets. The spines terminating the leaves were used as needles. The fibres were also used as bead strings, or were made into crude brushes. The Apaches still tie the poles of their "wick-i-ups" with yucca fibers or narrow strips of their leaves.

The roots of the yuccas have marked saponaceous qualities and are used by Mexicans and Indians alike for washing the delicate fabrics or woolens. It is also favored for shampooing, leaving the hair soft, fluffy and glossy. The Navajoes are said to wash their hair with this soap before participating in sacred ceremonials. It has also been used to some extent by white people and the demand for the roots has depleted large areas of the yucca plants, especially in the vicinity of Mexican or Indian settlements.

USES OF DESERT VEGETATION IN CONSTRUCTION

The desert shrubs and trees have had a significant rôle in providing shelter, not only to the native Indians, but to the Mexicans and American settlers, especially before importation of materials became easy. All the trees, but particularly mesquite and cottonwood, were used for supporting uprights, roof beams and poles. Sahuaro ribs, or the stems of the ocatilla, have been most commonly used as the framework for the walls of the wattle houses of the southern Indians. The ocatilla is an odd plant which grows in bunches of straight stems covered with blunt thorns to a height of 8 to 10 feet. When there is a fair amount of moisture the stems are covered with tiny rich green leaves, and in the spring each shaft is crowned with a raceme of torch red blossoms. These are suggestive, as the stems contain a resin which burns with a bright flame, and the Indians sometimes light the ends of the dead stems using them as candles or torches. The stems are sometimes set close together in the ground and bound for fences. The stems take root and when in leaf and bloom, these flowering fences are novel and attractive. Along the rivers where ocatilla stems and sahuaro ribs may be distant, arrow-weed stems may be substituted in wall construction. At any rate they afford the best of roofing material,

laid across heavier poles to support the cover of weeds and adobe.

In making the solid earthen floors of the Indian and Mexican huts, the stems of prickly pears are sometimes beaten into the adobe. The water in the stems has a peculiar cementing property when mixed with a proportional amount of loam and it imparts greater durability to the floor.

Except for barbed wire used by the United States Indian Service, the Indians have depended entirely upon poles from the aforementioned trees, or ocatilla, to build their fences and corrals. On the isolated cattle ranches of the white man, they are used in the same way. Ironwood, as suggested by its name, is exceedingly hard and too heavy to float in water. It is very hard to cut, but posts made of it more than 50 years ago are still sound. It is fine grained and susceptible of high polish, but unfortunately it is not abundant enough and grows too slowly to become of commercial importance. It is used somewhat in the manufacturing of novelties.

Many other plants have entered into the construction and decoration of the various household articles and artifacts of the native peoples of the Southwest, but as these plants are generally unfamiliar except to the denizen of the desert they need not be listed here. Many of these articles and uses have become obsolete with dependence upon the trading post, altho some are used in the rather incidental manufacturing of commercial souvenirs and novelties.

MEDICINAL USES OF DESERT PLANTS

The Indian medicine man did have some knowledge of healing herbs and did not always rely entirely upon magic. Investigations by competent medicinal botanists in the Arizona deserts might greatly enrich medical science.

Even the creosote bush, here came in for some use. Poultices were made by boiling the leaves. The boiled down liquid was taken internally for a cathartic. It is also said to ge a good tonic for the scalp, but its odor debars its use. The mesquite, during the summer months, exudes a liquid which has the properties of gum arabic. The gum was boiled by the Indians, diluted and used as a wash for sore eyes and open wounds. The bark of the arrow weed was used in a similar manner. Yucca also has some medicinal value, as it contains gum, grape sugar and saponin. The wood of the stems makes excellent splints because of its lightness and flexibility. The value of a number of other plants, known to have been used by the Indians, is open to question.

SCIENTIFIC INVESTIGATIONS

Several institutions have been set up in the Southwest aiming to investigate the economic possibilities, of not only native desert plants with possible modifications, but also of plants which may be introduced. The latest step is the establishment of a division of the Bureau of Plant Industry at Tucson, Arizona, with branch stations at Safford, Arizona, and Gallup, New Mexico, for the investigation of plants which may aid in the utilization of these arid and semi-arid areas. The immediate problems are to find plants which will thrive and at the same time afford good forage or will check erosion. This work is to be under the able direction of F. J. Crider who has been conducting similar investigations at the Boyce Thompson Desert Arboretum near Superior, Arizona, and from which unfortunately financial support for scientific investigation has been largely withdrawn. For a number of years the Desert Laboratory of the Carnegie Institution, located at Tucson, Arizona, has been unfolding much of what has been learned about the life of the Desert, but more from the viewpoint of pure science.[4]

THE DESERT BEAUTIFUL

Aside from the conception of utility of the desert which is concerned only with the physical welfare of man, there are other values, esthetic and intellectual.[4] The vegetation of the Sonoran Province is so unique and so varied that it has definite scenic values. To the practical man of affairs an appeal may therefore be made for the preservation of these unusual, and in some cases rare plants, in support of a thriving and increasing tourist industry. Fortunately the cacti and some other desert plants adequately protect their gorgeous blossoms from ruthless pickers. But the fad for potted small cacti thruout the country has played havoc with a number of the rarer varieties which propagate with difficulty. Legislation without adequate policing, has not solved the problem.

When the desert is at its best, carpeted with alfilaria and wild flowers, with the gorgeous golden bloom of the palo verde, the brilliant flowers of the cacti and the ocatilla, the rich green expanse of the creosote bush, all stretching to mountain ranges rising clean cut and angular, perhaps a hundred miles away, with the bright light of the day fading to a horizon of opalescence, for the ones who love it, it is hard to withhold a little wish that the quest for utility may perhaps not be too altogether successful.

[4] Forrest Shreve. The Problems of the Desert. *Sci. Mo.*, Mar., 1934, pp. 199-209.

FIELD WORK AS A FACTOR IN DYNAMIC GEOGRAPHY

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The geography which is in the process of rapid development today is a geography in which interest in human culture patterns has replaced interest in physiographic features, country-bounding, or product-listing, and in which interpretation and explanation accompany areal description. The exponent of this type of geography, instead of recording static facts, is trained to be aware of constant change. Facts are not stressed as such. The emphasis is upon analysis of regional trends and socio-economic patterns growing out of man's efforts to bring his affairs into harmony with the conditions of his natural environment.

As the values of this dynamic adjustment-geography become more generally recognized, field geography plays an increasingly important role. Since much of the geography of the world has come thru field observations, local field studies should accompany the geography work of the American schools. Altho in many ways American educative methods are far advanced over continental methods, in regard to field journeys for both history and geography, Europe is far ahead of us. Most of the countries of Europe are definitely field trip conscious. Many of the schools of Germany, for instance, offer ten days a year of work in the field in the upper elementary and secondary classes,[1] under the guidance of a teacher who is trained in the modern dynamic geography.

On the assumption that an introduction to the geographer's field technique would prove of value to liberal arts students, the writer was granted the privilege of inaugurating a field study unit required as part of the laboratory work in the beginning course in Principles of Geography at the University of Washington.

THE ADJUSTMENT-PATTERN STUDIED

The Union Bay Lowlands, a reclaimed delta and lacustrine plain within an easy two-hour compass of the campus, was selected as the area to be studied. Briefly the historical geography and present land utilization of the area may be described as follows. When the first settlements were established in this district, some fifty or sixty

[1] Rose B. Clark. "Geography in the Schools of Europe," Part II, in Bowman's Geography in Relation to the Social Sciences. Charles Scribner's Sons, 1934.

years ago, the entire lowland area was a shallow arm of Lake Washington known as Union Bay. The surrounding gravel hills were forested with Douglas Fir. Upon this resource as an economic basis, coupled with an advantageous location for water transportation and the storage of logs, a small lumber town, called Ravenna, developed. This town, in its boom days, was located about five miles from the city of Seattle, but five miles in those days meant considerable isolation, so Ravenna developed as a self-sufficient civic center with an identity of its own.

Two mills and several other related industrial establishments were located along the old shore, where also was placed the Northern Pacific Railroad coast line from Seattle to Everett. As the hills back of Ravenna became deforested the town began to decline, and the lumber mills became increasingly marginal. Meanwhile Seattle expanded along the uplands, as transportation facilities permitted, until it completely surrounded the old town. With the development of the street railway system and the automobile, the lowlands lost their attractiveness as residence locations. The newer houses and higher property valuations were now found on the uplands. Due to this change of land values and the factor of obsolescence, Ravenna became almost a ghost town. Then in 1916 the Government Locks at Ballard were built, connecting Seattle's two fresh-water lakes with Puget Sound. This automatically lowered Lake Washington about eight feet reclaiming the swamp land of the old arm of Union Bay. Today this lowland is in intensive agriculture, worked by Japanese farmers, the lumber mills along the old shore line have changed over to lumber storage sheds and fuel yards, the old town of Ravenna may still be identified, and newer swamp lands, only partially reclaimed, have appeared nearly a half mile south of the old location.

The interest of a field group studying this area with the viewpoint of the adjustment geographer, centers in determining the reasons, not only for the present culture pattern, but for the successional adjustments that have taken place. There is ample evidence in the field to reconstruct the historical geography of Ravenna. Many old frame houses, an abandoned country store, and old orchards, thru some of which newer streets have been graded, may be seen.

Emphasis on Land Economics

One of the more practical features of the trip, however, is the analysis of the lowland area to determine whether it represents high cost land or low cost land. Raw lowland in the Puget Sound area

is comparatively cheap. But by the time it is cleared of a temperate marine jungle of alder, and other semi-hardwood deciduous trees, and properly drained, it assumes a relatively high cost. In this particular region, to the above factors may be added a restricted area of only thirty-eight acres, with choice peat-muck soil, located within the city limits of Seattle. All five of these factors tend to make the cost high per acre of agricultural land. What type of crop must be raised in order to pay on such high cost land? Intensive truck gardening is perhaps the most economical use that can be made of it. Local markets for such products also favor this adjustment. Hence the intensive truck gardening is accounted for. What about the social pattern? Why is the gardening done by Japanese? Truck gardening of the intensity found here requires much labor, and that labor must be low cost, yet efficient. Other factors have already sent the unit cost of production abnormally high. Also the Japanese farmer is used to working with peat-muck soils, and, finally, obsolescence has made residence valuations fall and the white man seek to get away. Thus conditions are optimum for the penetration of the oriental farmer.

Because of various natural environmental conditions intensive truck gardening by oriental farmers may almost be said to be the normal trend of land utilization in this lowland area. Across the highway to the south the more recent swamp land is owned by the University of Washington, a fact which, alone, would indicate a deflection from the "normal" economic utilization. This land lay unused, harboring a jungle of deciduous undergrowth, until the spring of 1934. At that time a company of CWA workers undertook reclamation. Drainage ditches were established, most of the deciduous growth was grubbed out, and nursery stock was planted in part of the cleared area. The process of reclamation is, obviously, the feature of prime importance here.

Some Student Reactions

It is probably needless to say that a field study of this type has proved exceedingly popular with beginning students in geography. But is it worth while? Does it make a valuable and lasting contribution to the education of the students who take the course? In the mid-quarter laboratory examination the following two questions have been included: (1) What is your conception of the principle back of field geography? and (2) Of what value is an introduction to the methods of field geography to the average individual traveling thru the country?

A few typical student reactions to the questions may indicate how well the work is being received and what values are being derived. "The average individual traveling sees only land forms. He does not see what other natural features are influencing man's economic and social adjustments."

"The principle is to find the reasons for man's economic activities. The elements of environment are used to explain, or rather, help explain, human activity."

"The average individual may enjoy his travel thru the country. How much more will he enjoy it if he knows the basic 'whys' for human adjustments. The introduction to field geography is of great value because it helps him to understand (instead of just see) the geography of the regions he visits."

"It develops a technique of observation, and it answers many of the 'whys,' or at least gives one a method by which he can answer his own questions as to the reasons for certain cultural adjustments."

"Most of us thought that geography consisted of plain facts already old and established, but field geography makes geography alive and interesting, and it makes one think of what he sees about him. It is good because it teaches one to reason and not depend entirely on books."

A review of student reactions would not be complete without this one, written by a rather mature student with a heavy economics background: "Field geography to me represents a coming aspect of good business acumen. The recognition of whether or not a certain land or property is suitable to such and such adjustment on a scientific basis will certainly lend itself to a carefully planned social economy. Such service is bound to become indispensable to the planned economy toward which our country is going."

Responses like these may be tinted with a bit of flattery, but coming from liberal arts students and not geography majors, who would be expected to be enthusiastic, they encourage a decided tendency to feel that field effort is well spent.

One can perhaps find no better means of closing this discussion of the dynamic values of field geography than by quoting from a Japanese boy who wrote rather whimsically regarding one of the questions stated above, "To know field geography is to cultivate common sense. It is not necessary to tell how common sense is important at the present time."

SOME POSSIBILITIES FOR FIELD WORK IN ELEMENTARY GEOGRAPHY

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EMPHASIS ON FIELD STUDIES

Geography departments of colleges and universities are placing increasing emphasis on the value of directed field studies and of independent field investigations. Geographical magazines publish articles based largely on field studies of the contributors. Governmental agencies are making extensive use of geographical surveys in determining sound policies for land utilization and for economic planning. Trained field geographers are finding positions in the personnel of numerous government enterprises. Assignments to special investigations are made on the basis of the training and the experience of candidates in previous enterprises requiring skill in field observations and the interpretation of the natural factors involved.

The elementary school, in its appropriate field, offers to teachers and pupils similar opportunities for making personal observations in the local community and for learning the meaning of the relationships observed. On every side, in every school district, objects of nature and the activities of the people offer material for direct observation and simple explanation by geography classes of all grades in the elementary school.

The natural environment of any region may be analyzed into ten large units for study and observation. The human activities of any region may be classified into three large units with various subdivisions. These elements of the natural environment and the chief kinds of human activity are set forth in the following outline.

ELEMENTS OF GEOGRAPHY

Elements of the Natural Environment	Chief Kinds of Human Activity
1. Location	1. Economic Activities
2. Surface or relief	(a) Agriculture
3. Climate	(b) Mining
4. Soil	(c) Manufacturing
5. Minerals	(d) Commerce
6. Water Supply	(e) Grazing
7. Ocean	(f) Lumbering
8. Native Plants	(g) Hunting and Fishing
9. Native Animals	2. Political Activities
10. Other Peoples	3. Social Activities

A study of these two groups of facts of any region and the relating of the facts of the two groups to each other constitutes a geo-

graphical study of that region, whether the region is the local community, the state, the nation, or the world. So far as the elementary teacher and her pupils observe and explain these items and their relationships in the home locality, they are carrying on "field studies."

We may examine the extent to which these elementary field studies may be carried on, by learning how such field studies have been carried on with pupils of the elementary school, or with teachers in training for elementary school positions.

A THIRD GRADE FIELD LESSON

A third grade class, learning some of the basic geographical terms relating to the surface of the land, went outdoors to observe and explain some of the geographical items in the immediate vicinity of the school. Under the guidance of the teacher the pupils made the following observations, talked freely about them while in the "field," and used them for further classroom work in "Home Geography."

1. The school campus of 56 acres sloped gently from the higher land at the northwest to the lowest point at the southeast.

2. The school buildings were on the higher land. The rain thus flowed away from the buildings to the lower land.

3. A gentle valley led from the ridge on which the buildings were located, southeastward across the campus. The location of the buildings with reference to elevation and slope insured good drainage and dry basements.

4. Standing at the bottom of the little valley, these third grade pupils were asked to find and point out the number and direction of the valley slopes. One pupil replied: "The valley has three slopes, one on this side, one on that side, and another slope down this way, or the water would not run off." Thus, in five minutes, there was established in the minds of these third grade pupils by actual observation and oral explanation a fundamental fact in the physical geography of the land, that is, *every stream valley has three slopes.*

5. A short walk beyond the school grounds brought this class to a street where the street car tracks followed the configuration of the land up and down gentle slopes as the street ran crosswise to the low morainic ridges. Across the field a railroad track was in view, running parallel with the street. Observation and discussion showed that the railroad tracks did not go up and down the slopes, but deep cuts were made across the ridges, and a railroad grade

was built up across the lower lands between the ridges. These third grade pupils observed and understood that the railroad builders found it better to make a level track on which to move the heavy loads, while the street car company could move the lighter loads easily up and down the gentle slopes.

The pupils were asked to observe the location of the houses and the open lands within view. The houses occupied the ridges. Pasture lands and orchards occupied the lowlands and creek valley. Pupils observed and understood that good drainage was secured for the houses on the ridges. One pupil remarked: "I know a man who built his house near the creek. Last spring the basement was full of water. He ought to have built his house on higher ground."

These pupils obtained concrete knowledge concerning the land surface of their immediate neighborhood in relation to building sites, crop lands, and transportation lines. These outdoor observations helped the pupils to read their books more understandingly.

A Visit to a Farm

A study of agriculture is included in the geographic treatment of any region or continent. More than one-half of the school children of America live in cities. City children cannot enjoy the personal experiences of the children who live on farms. They need a closer touch with the farm and farm life than is afforded by books alone or by rapid automobile journeys along well paved state highways. Experiences which give increased understanding and appreciation of the farm, farm life, and farm products may be secured by visits of the elementary school class to nearby farms.

A fourth grade class was making a study of the Corn Belt. The school was near the edge of the town. The teacher arranged with the owner of a farm within a short distance of the school for a visit to his farm. Here, under the direction of the teacher and the farmer, pupils observed the farm buildings, the fields, the crops, the farm animals, and farm life in general. By means of questions and explanations in the presence of the realities of farm life, these pupils became acquainted with facts of agriculture that had a deeper significance than information obtained only from books and a teacher's oral explanation. Some of the items observed and explained follow.

1. The size of the farm, 110 acres. The boundaries of the farm were in view from the barn and readily pointed out.

2. The size of the farmstead, 5 acres. The limits were easily ob-

served. The locations of house, barn, dairy, poultry houses, garden, orchard, were related to the needs of the farmer and to his work.

3. The fields and their crops. Pupils saw the growing crops of a typical Corn Belt farm: corn, oats, alfalfa, and pasture. The arrangement of crops in the field at the time of observation was pointed out and the farmer's plan for rotation of crops during the next two or three years was explained.

4. The farm machinery and tools. Plow, harrow, mower, hay rake, binder, wagon, shovel, spade, fork, and other machines and tools were observed in the machine shed or in the field. Farm machinery and its relation to American agriculture became a reality to these boys and girls.

5. Horses, cattle, swine, chickens. These were the animals on this farm, which was chiefly a dairy farm. A visit to the barn and to the dairy house acquainted the class with storage of hay and grain for winter feed, the care of the animals, and the work involved in the production of milk, its preparation and distribution to the citizens of the town.

This field lesson, occupying two hours of school time in the afternoon, gave fourth grade pupils basic ideas for better understanding of agriculture in their home locality and elsewhere than could be obtained from books alone.

CITY PUPILS STUDY IN THE COUNTRY

Two fifth grade teachers in an elementary school in Chicago asked whether their pupils could be given a "field lesson" in the open country where they might see streams, tributaries, forests and fields. In the immediate locality of the school were only paved streets, cement sidewalks, brick and stone buildings, and railroad tracks. Written permission was obtained from the parents of one hundred pupils to spend an afternoon in field study under the direction of their teachers and the principal. The journey involved a street car ride of fifteen miles, including two transfers. The area for investigation was along the Des Plaines River west of the city limits.

Here were actual examples of river, river valley, flood-plain, tributaries, gullies, erosion, open woodland, prairie land, farms, crops, and farm animals.

Pupils were eager to observe and to identify the geographic features and to explain their relationships to each other and to the work of the people of the locality.

Pupils received visual instruction of the highest type and added power to understand later observations as they visited or traveled in the open country and as they continued their school studies and general reading.

A LESSON AT THE STOCKYARDS

Geography deals with animal industry as one phase of agriculture. Some cities are noted as centers of great stockyards where animals sent from farms are prepared for food, and shipped to all markets of the land. A seventh grade class in a Chicago public school visited the Chicago stockyards during the school hours of one afternoon. The broadening influence of the trip was well expressed by a pupil, when, on the following day, she said: "I have always lived in Chicago and have heard people talk about the stockyards. I supposed that they were about as large as barns or stables, and were located on the four corners of a street crossing." These pupils were now better prepared to tell others about one of Chicago's industries and to read more intelligently about Chicago and its manufacturing interests. Correct and comprehensive knowledge of one large industry enables the learner to evaluate more certainly the extent of other leading industries.

TEACHERS INVESTIGATE POSSIBILITIES OF FIELD LESSONS

A class of gography teachers in a summer school session at Clark University spent two hours in a field lesson. The purpose of the lesson was to show how any home town could be used to illustrate the relation between manufacturing and transportation and other items of the environment. A five-minute walk brought the class to the "bridge" spanning the tracks of the railroad. From this point they looked in both directions along the railroad and observed almost continuous rows of factories with sidetracks alongside the factory buildings. The party then walked for a mile or more along the streets nearest to, and parallel to, the railroad. They noted the kinds of factories and storehouses, and the facilities for loading and unloading raw materials, manufactured goods, fuel, and other items.

At one place was a factory making heavy machinery. The arrangement of factory buildings, sidetracks, equipment for handling heavy loads, the huge piles of fuel, lumber, iron and steel, and the linear extent of the buildings along the railroad tracks, all indicated the careful planning for efficient and rapid handling of bulky and heavy materials.

At another place, a clothing factory was located several hundred

feet from the main railroad tracks, without sidetracks to the door of the factory. The building was not near the smoke and dust of the trains. It was well lighted and surrounded by park-like grounds. Shipment of raw materials and of manufactured goods was made thru freight and express offices and not in carload lots.

Coal yards along the railroad with modern equipment for handling coal both shipped in and hauled out showed how heavy freight is handled rapidly and at slight expense.

The influence of a field lesson of this type was well expressed by one of the group, a young man who was principal of an elementary school in a coal mining town in Pennsylvania. His statement was substantially as follows: "This has been an interesting experience. Everything we have observed along this mile of railroad tracks is illustrated on a smaller scale in my home town of 5,000 population. I now see for the first time that we have in our home town actual economic conditions that are representative of geographic items in other regions. I can now use local material for instruction in a manner that had never occurred to me before. Our coal mine, our small factories, our railroad facilities have today become to me an open book that I can help our elementary teachers and pupils to read."

Relief Features in Miniature

A field lesson of a different type was planned for a summer school class. A graduate student of wide experience as a superintendent of schools and as a college teacher of geography asked for the privilege of joining the class. The purpose of this field lesson was to show how the physical features near the school building may illustrate, in miniature, the larger surface features that we read about, but can rarely visit.

The first place for directed observation was the margin of the pond in the park, just across the street from the University. Here experienced teachers displayed as much interest as children in finding, identifying, and explaining actual examples of: land and water, shore line, stream valleys, canyons, erosion, transportation, deposition, delta, floodplain, cataracts, waterfalls, natural bridge, river piracy, the pirate stream, the beheaded stream, growth of valleys, wave-cut cliffs, and many other terms.

A five-minute walk brought the party to a bridge across a small brook a hundred yards downstream. This brook was joined by another brook and their united waters flowed on across the level land. Low bluffs bounded the valley sides. Here the observers saw, in

miniature, two rivers joining to form a larger stream. They studied the scene as if it were a map. They interpreted the actual scene in terms of their own map studies and the realities that lay back of the map. Within a few minutes they saw before them, in miniature, the site of Pittsburgh. They were standing on a bridge over the Monongahela River; at the right the Allegheny River was in view; and below the junction, the Ohio River flowed away in the distance. The level land between the two streams and on either side represented the lowlands of Pittsburgh. The bluffs on either side represented the high, steep sides of the valleys at Pittsburgh.

This view lent significance to the location of a city at the junction of stream valleys along which transportation may move readily by water or by railroad and highway.

Another ten-minute walk *down* the valley brought the party to a stone dam, ten feet high, built across a third brook where it entered the same valley as the first two brooks. Above the dam the water of the third and larger brook spread out into a large pond. The water from the pond was conducted thru the electric light works and used to aid in the operation of the plant, but not directly for power. The junction of these three brooks marks the beginning of the Blackstone River, famous for the number of spindles along its course of 45 miles from Worcester, Massachusetts, to Providence, Rhode Island.

Density of Population in the School District

An item of growing importance in elementary geography deals with the population of regions and of countries. The area, population, distribution and density of population in any region are essential ideas in the field of human geography at the elementary school level and at all higher levels of study. In every school district, there is opportunity to study this geographic item. In a rural school, the teacher and pupils may construct a map of the school district, indicate the location of every home in the district, and the number of persons living in each home. The area of the school district is readily learned, and the density of population for the school district can be accurately determined. In a village school, a map of the village may be constructed, the homes counted, and the population determined approximately by counting four persons or five persons as the average number living in one home. In larger towns and cities, an area of one square mile, a half square mile, or a quarter square mile may be marked out by street boundaries, the homes counted,

and the population estimated. Comparisons of density of population in city and in country, on plains and among mountains, in regions of temperate climate and arctic climate, become more effective in the light of having determined the density of population in the country and in the town of the home region.

The teacher who learns the geography of the home community by personal observation will have no difficulty in organizing and directing field studies for pupils of the elementary school.

INTEREST STIMULATING DEVICES

Testing Geographic Knowledge by Head and Tail Competition

Divide the class into two groups and have each group nominate a head or foreman. The foreman of one group then pronounces distinctly the name of any geographic place name such as a city, a river, a mountain, a lake, or a country. The opposing side then must use the last syllable of this word as the beginning of another place name, whose last syllable in turn must be used at the beginning of another one. Failure to respond quickly results in a score for the opposite side. The skill lies in offering words whose "tail" syllables are so difficult that the opponents find it difficult to reciprocate and thus lose a point in the game.

Example. Offer of one team: Rio de Janiero. As the ending syllable is "ro," the opposing team may submit the place name, "Rome," or any other place name beginning with "ro." The other team may then submit Mediterranean or a word beginning with "me." This in turn calls for a place name beginning with "an." Failure of one team to respond quickly results in a score for the opponents.

This game not only creates an interest in geography but is an excellent exercise in developing knowledge of geographic place names. G. P. BHAVE, *M.R.A.S.*

Government Middle School
Murtozapur, Berar, India

A City Game

A device which has helped my fifth grade keep in mind locations of important cities of United States is the use of a city game. Each child prepares two or three slips of paper containing a locational fact about some city and the name of that city. A child, who is selected to take charge, reads them, giving each child in order around the class a chance to answer. If one misses, the next answers. Any who answer correctly are given the slip. At the end of the lesson slips are counted and the one having the most wins. Interest is keen and the children learn locational facts about cities both in preparing the slips and answering them. After each region is studied slips may be saved and used as a rainy day game or in a year-end review.

EDNA SKINNER

Collensville, Connecticut

NOTE

Send descriptions of your interest-stimulating devices to the JOURNAL. We will be pleased to pass them on as an aid to others, thru the pages of the JOURNAL. There must be hundreds of teachers who have worked out these aids in teaching. Make your description brief, clear, and exact so that another teacher may follow your directions. EDITOR

EDITORIAL NOTES AND NEWS

Frankfurt-am-Main has been designated as the European terminus of the transatlantic air lanes traversed by Dr. Hugo Eckener's Zeppelin. Formerly, Friedrichshafen on Lake Constance served in this capacity, but the change to Frankfurt-am-Main was made due to its location nearer the population centers of Europe as well as nearer the heart of Germany.

The Department of Geography of the world Federation of Education Associations will hold two sessions in connection with the biennial meeting at Oxford, England, this coming summer, August 10-17. A large representation of geographic education from the United States is desired. All those interested in geographic education, and planning to attend the meetings, should communicate with the Secretary, Erna Grassmuck, State Teachers College, Indiana, Pennsylvania.

Miss Grassmuck would also like your cooperation in connection with the two sessions of the National Council of Geography Teachers held in connection with the annual meeting of the National Education Association in Denver, July 3-4.

Among the political changes to be noted in your teaching are the restoration of the Saar to Germany following the plebiscite of January 15, and the agreements between Italy and France regarding their African Colonies. Italy gets about 45,000 square miles of desert territory added to southeastern Libya. To Eritria is added a narrow strip bordering the Strait of Bab-el-Mandeb, a concession from French Somaliland. Also, the Italian Colonial Government gets a few shares in the French railroad extending from the Strait in French Somaliland to the Ethiopian capital, Addis Ababa. This is Ethiopia's only direct rail outlet to the sea. By the acquisition of these rail shares, Italy hopes to facilitate its trade with Ethiopia. Unfortunately, border troubles between Italian Somaliland and Ethiopia are complicating the economic stability of the area.

Among the recent changes in Russian place names is the change from Nijne-Novgorod to Maxim Gorki, sometimes shortened to Gorki. This old settlement was the seat of one of the world's greatest trading fairs and was the meeting place of the people of the old inhabited parts of Russia with those of the newer settlements east of the Volga.

According to Joseph Haliczer writing in *Geography*, December, 1934, Europe has four times as many people as it had two hundred years ago. During this period the center of population has shifted eastward 124 miles, being at present about 30 miles north of Vienna.

Chemists of the U. S. Department of Agriculture are, it is believed, developing to a point of commercial practicability, a process of making rayon from the alpha cellulose derived from bagasse. Bagasse is the crushed fiber and pulp left after the juice has been extracted from sugar cane. In the past, most of it has been a waste, except for what has been burned as a supplementary fuel in the mill's boilers, or that which was made into building board. Thus far, our rayon has been made from wood pulp or from cotton linters, the short fibers that still cling to the cotton seed after ginning.

Anyone interested in summer schools in Europe will find in *Foreign Travel*, March, 1935, brief descriptions of the courses and attractions offered and costs involved at a number of European educational centers.

GEOGRAPHICAL PUBLICATIONS

Esse V. Hathaway. **Romance of the American Map.** 316 pages. Illustrated. Whittlesey House, New York

Less than four and a quarter centuries ago no map of the World included the North American continent. A little later when it first appeared on maps, only the coastline along which the early explorers sailed was shown, the interior being left as a great blank space containing many mysteries which in the cartographer's mind often took the form of strange men and animals.

The story of how these mysteries of the hinterland came to be supplanted by accurate map detail is the one which this book tells. Dealing as it does with the history behind the map rather than with the map itself we have a particularly exciting and thrilling story of the men who, overcoming superstition and fear, blazed trails thruout the continent and opened up its vast possibilities to their fellow countrymen. The early chapters tell us of the English, French and Spanish explorers, their varying motives and methods, what they encountered and endured in the field and finally what each added to the American Map.

With our map thus partially unrolled by these intrepid men from beyond the sea, we turn to the later chapters of the book for the story of our own frontiersmen who filled in the gaps in the map left by the early explorers. Equally as thrilling as that of their predecessors, this story is perhaps more interesting because it is peculiarly our own. One by one, we follow these men, who bear names well known in American history, thru their vicissitudes and triumphs, as they open up new territories and add more detail to our map. Finally in 1869 with Powell's exploration of the Grand Canyon the last blank spot is filled in and "the conquest of a continent," which began nearly four centuries before is ended.

Thruout the story, the author by her inimitable style, makes history live again and one can scarcely put down the book once he has started it. In addition the text is ably supported by well drawn illustrations and maps in black and white—another factor which stimulates the reader's interest.

GUY H. BURNHAM

Clark University

Nellis M. Crouse. **The Search for the Northwest Passage.** 524 pp., 4 photos from drawings, and one map. Columbia University Press, 1934. $4.00

The contribution made by this book is to bring within two covers a history of four hundred years of search for and exploration of the Northwest Passage. From Cabot to Amundsen, the author causes these intrepid explorers to pass before the eyes of the reader; a remarkable story of four centuries of search, costing millions of dollars and many lives, for something which was of no practical use when found.

The historian and the geographer will read this book with much profit. Arctic history and Arctic geography are both clarified. Even if there has been little of practical value which has resulted from these explorations, one must respect the scientific spirit which prompted them. One cannot help but contrast the hardships and dangers of those early expeditions with the comparative comforts which surround modern polar explorers.

As the author points out, then it was not thought proper for commercial interests to finance such expeditions for notoriety or advertising which they would get from them. The British government did most of the work with some assistance from the Scandinavian countries and from the United States. It is refreshing to read of such backing after the commercialized efforts of today.

The reader closes the book regretting the lack of photography of those days.

C. E. COOPER

Ohio University, Athens, Ohio.

N. P. Gist and L. A. Halbert. **Urban Society.** 740 pp. 16 figs. (Mostly maps). T. Y. Crowell Co., New York. 1933. $3.50.

The growing interest in cities reflects their increasing importance. Many geographic studies are being made of urban areas, and all teachers of geography must necessarily desire fuller knowledge of cities. "Urban Society" is an excellent, readable summary of the better geographic and sociological studies of cities. The first 213 pages are largely geographic, considering classification, growth, location, and ecology of cities. The physical aspects of the city (Chapter 26) also will appeal to geographers. The index of cities referred to (about 200) is also of considerable interest and potential use to teachers of geography.

Geography teachers can find much helpful material in this careful presentation of the essentials of many scholarly studies of cities.

STEPHEN S. VISHER

Indiana University

Clarence A. Mills. **Living with the Weather.** 206 pp., Caxton Press, Cincinnati, Ohio, 1934. $1.50.

Teachers of geography must live with the weather, too, and they may well be interested in a physician's impressions on the subject. Dr. Mills is Professor of Experimental Medicine in the Medical School of the University of Cincinnati, and has published several scientific studies of climate and health. This book is, however, for popular consumption, rather than being a good summary of the scientific studies that have been made on the subject. He, of course, makes considerable use of some of Ellsworth Huntington's work, but believes that the climate of the north central and northeastern parts of the United States is too stimulating for the best health of many people. This is partly because many people are overstimulated by their manner of living. He is much impressed with the significance of changes of weather on mental health as well as on physical health. Those who do not live in one of the better climates of the world, according to Huntington, will welcome Dr. Mills' conclusions as to the disadvantages of such climates and the advantages of some that Huntington considers less desirable. Dr. Mills, however, suggests methods by which the overstimulating climates can be made less harmful to high-strung people, and he freely admits that progress is more rapid and civilization higher in the more stimulating climates, despite their handicaps.

STEPHEN S. VISHER

Indiana University

C. A. Dawson (assisted by R. W. Murchie). **The Settlement of the Peace River Country.** Vol. VI of the Canadian Frontiers of Settlement series. 284 pages. Illustrated. The Macmillan Co., Toronto, 1934. $4.00.

Settlement of the Peace River Country has repeated essentially the history of numerous communities in the interior of North America. There are differences to be sure, for the settlement of the Peace River Country is a modern phenomenon and must be viewed as such. As in the older areas the first outposts gradually gave way to isolated settlements later to be integrated into well organized communities which in the final stages acquired regional maturity.

The first pioneers who penetrated the Peace River Country were handicapped by their isolation. First they raised livestock for they could ill afford to raise grain before the means of transportation came within reach. Cattle, less dependent on the railroad, could be driven to market. Many out on the fringe supplemented their income by working in the harvest fields of the older areas. These were the first stages in the economy of the frontier. When transportation came nearer they turned to grain farming specializing in wheat.

Another important accompaniment of the transformation was a change in the size of the holdings. On the outer fringe the farms average 275 acres representing the capital available for acquiring land. In the older area the farms are larger varying from 475 to more than 500 acres indicating that large areas are required to carry on agricultural activities successfully. Generally yields are higher on the new lands in the fringe area and on newly broken lands in the older zones. Characteristically the early settlers have established credit and, therefore, their farms are more heavily mortgaged than those on the fringe.

The expenditures of the people reveal the "level of living" and the stage of their economy. Out on the fringe, as on all frontiers, living is primitive. Where the income is low half of the cash goes for food, twenty per cent for clothing, and the remainder for operating the house, for advancement and for health. Among the more prosperous a smaller proportion is required for food and consequently more is available for advancement and health. The social institutions, particularly the churches and schools are partially subsidized by older communities, making it possible for the frontier settlements to enjoy these facilities before they are able to pay for them.

The authors have made a useful contribution to the study of settlement, for they have had a unique opportunity of witnessing, contemporaneously the various stages in man's occupancy of his habitat.

GUY-HAROLD SMITH

Ohio State University